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Abstract In Thailand, majority of fruit crop farmers are independent growers, who are smaller scale in the Upper North, and relatively larger in the Lower North and in the Central regions. Many become engaging in entrepreneurial functions, improving fruit quality and productivity, and positioning themselves to produce for export market. To reduce logistic inefficiencies and transactional cost, the fruit growers have collectively self-organized membership-based farmers groups (FGs), to make business gareement with private fruit exporters. The objective of the paper is to elucidate the use of multi-stakeholder process as an interactive learning methodology to capacitate farmers to produce quality mango for export. Two membership-based mango growers associations in the North were selected for studies The Prao Mango Farmers Group (P-MFG) in Chiang Mai province, representing the Upper North, and the Noen Mahpang Mango Farmers Group (NMP-MFG) in Phitsanulok, representing the Lower North were collaborated throughout the participatory learning processes. The P-MFG and the NMP-MFG possessed different organizational structure and marketing innovation. Despite the difference in organizational structure and marketing strategy, both groups showed similar pattern of disconnectedness between members and group leaders or group committee. The multi-stakeholder processes where governmental agencies, agro-chemical suppliers, and private fruit exporters were included in the later stage after FG members had built up their sense of self esteem and confidence through farmer-researcher interaction. The modified Porter's Diamond model helped improve the positioning of each partner in driving towards mango fruit cluster.

Key words: Fruit cluster, multi-stakeholder processes, innovation, interdependence

INTRODUCTION

Mango has increasingly become an important fruit crop contributing to rural Thai economy. Thailand ranks fifth in the world production of mango after India, Pakistan, China and Mexico. But only one percent of its total production is exported, with largest export volume goes to Japan. The main preferential variety is Nam Dawk Mai, occupying the Japanese market from 6.4 percent in 2002 to 32.9 percent in 2005. Increasing integration of agricultural production in national and international supply chains present a new challenge for smallholder farmers to position themselves in the globalizing economy.

Majority of mango farmers in are independent growers, who are smaller scale in the Upper North, and larger in the Lower North, and in the Central region. The conventional marketing arrangement is still widely practiced whereby the mango farmers deliver their farm produce to influential local collectors, or sell their products directly to local traders who visit and buy at the farm. The product is sold as bulk with slight grading or without grading. The quality is hardly met export standards. Price at farm gate is low and highly fluctuated especially during the peak harvesting season in March-April. .

During the last decade, mango has been exported through farmers groups who are formally registered as community business venture (CBV), notably the CBV group at Chachoengsao province in the Central region, which has reached certain level of fruit crop technology maturity. A few self-organized and membership-based mango farmers groups (FGs) are gradually engaging in entrepreneurial functions, improving mango quality and productivity, and positioning themselves to produce for export market, by negotiating business agreement with private fruit exporters, and agro-processing companies for fair price.

In Northern Thailand, many informal mango farmers groups are formed to improve fruit productivity and quality with the aim of exporting through making trading agreement with private exporters. They are self-organized groups with wide range of memberships and operational scales. The well known groups include FGs in Phetchabun, Phichit, and Phitsanulok provinces in the Lower North, and Chiang Mai province in the Upper North. The FGs in the Lower North operate at larger scales, having larger number of members and planted areas than the Upper North. Logistically, the FGs in the Central region, being closer to the wholesale markets in Bangkok and private exporters, possess better competitive advantage than the FGs in the Lower North, and Upper North.

During 2003 the policy for export promotion of quality fresh fruits and vegetables was being pushed forwards by the Commerce and Agriculture Ministries. The Porter's concept of "the Competitive Advantage of the Nations" has adopted by the Government to strengthen industrial sector and subsequently being extended to agri-food industries. Competitiveness is seen to be rooted in a nation's microeconomic fundamentals, that is the company operations and strategies and the quality of business environment in which the companies compete (Porter, 1998). Porter describes four keys to a nation's competitive advantage relative to other countries include: demand conditions, related and supporting industries, factor conditions, and company strategy, structure and rivalry, which often referred to as "Porter's Diamond model".

This research project perceives the competitiveness of Thai mango relying on integration of production and chain management with collective action of multi-stakeholders. The "cluster strategy" approach of Michael Porter's "the Competitive Advantage of Nations" was adapted as a guiding principle for cooperating to compete (Berdegue, 2001). However it is often observed that the power relations between FGs and traders-exporters are asymmetric, with

traders-exporters having more control and benefits over the FGs, thus resulting in conflict. It is also well recognized that farmers are heterogeneous with multiple objectives, and with varying degree of apprehension. There is a need of incubation period for FGs to build up competence through collective learning, and establishing a network of relations to consolidate new knowledge and translate into location-specific practices, and for FGs to build up capacity to the level that they feel more confident to negotiate in everyday practice.

This research project thus has general objective of developing mango cluster for improving competitiveness of mango in export market it has three specific objectives, namely 1) to develop "mango cluster" processes for improving farmers' capacity, 2) to analyze enabling conditions for developing "mango cluster", and 3) to analyze opportunity for scaling out the "mango cluster" strategy.

The paper perceives the competitiveness of Thai mango relying on integration of production and chain management with collective action of multi-stakeholders. The groups and network or cluster strategy approach is attractive if the process could be contextually designed so that to make each actor responsive and committed. It is conceivable that increasing integration of agricultural production in national and international supply chains present a new challenge for smallholder farmers to position themselves in the globalizing economy.

2. METHODS

Two membership-based mango growers associations in the North were selected for studies The Prao Mango Farmers Group (P-MFG) in Chiang Mai province, representing the Upper North, and the Noen Mahpang Mango Farmers Group (NMP-MFG) in Phitsanulok, representing the Lower North were collaborated throughout the participatory learning processes. The key processes included key informant interviews, farmer meetings and workshops, farmer survey and individual household interviews, stakeholder workshops and field visits. Information from key informant discussion, field survey and farm household interviews were used as the basis for farmer workshops to provide interactive learning among farmers, and between farmers and researchers, and to help assess group performance. Various analytic tools were used in the farmers and stakeholder workshops, such as SWOT analysis, modified Porter's Diamond model, etc. to provide broader perspectives for farmer members and other stakeholders on the issues such as interdependent and integrative nature of supply chain management of quality mango product in the export market.

The descriptions of five different assets that are related to production and business ventures of two FGs from Chiang Mai and Phitsanulok are given in Table 1.

Since each group has its own distinct social, economic and ecological characteristics, and within group the members are endowed with assets of varying values, the research team approached each FG independently. After introducing and clarifying the research objectives and aims, the research team made direct visit to individual farms to observe site conditions and study farmers' attitudes on mango production and market prospects as well as their expectation of group organizational structure and group performance. All information was shown and discussed openly with group members, either individually or collectively in small groups to receive the farmer feedback. The process of farmer dialogue was considered as shared learning, trust building, and capacity building. It was evident that each farmer member had different farm plans and mango farming experience. To establish common strategies without thorough understanding of individual household's social and ecological context, the outcome could lead to confusion. It was essential to gradually build up farmers' analytical skills through group clustering, engagement and functionality, and identify individual needs and expectation. The research team and FG members were then conducted SWOT workshop. Through facilitation process, the workshop offered social learning space for the

group governing committee and group members to interact collectively on the issues that could have impact on their outcomes.

When FG members were more confident and familiar with workshop format and discussion on emerging issues, researchers from governmental institutions and universities, as well as provincial and district extension agents were invited to participate in the workshop to share information and formulate future programs that could help strengthen mango FGs. The private exporters from Bangkok, and managing director and staff of the fruit processing plants were invited to take part in the multi-stakeholder dialogue. Farmers learnt about the export procedure from private exporters, and in return, the private sectors visited fruit orchards to learn about mango cultural practices and orchard management for quality production.

Table 1. Characteristics of five assets affecting farmers groups' production and business performance from Chiang Mai and Phitsanulok provinces

Assets	Prao, Chiang Mai (P/MFG)	Noen Mahpang, Phitsanulok (NMP/MFG)
1. Natural	Lowland-upland ecosystem interface, with undulating uplands, soil with moderately fertile, three distinct cropping seasons	Rianfed upland ecosystem dominated by gravel soils with low fertility
2. Physical	Certain farm roads are less accessible during rainy season, all households have electricity	All-weathered farm roads, some farm households in fruit orchards do not have access to electricity
3. Financial	BAAC is the main source; Less revolving fund to purchase inputs and mango	BAAC is the main source; FG sets up revolving fund, cooperative supply shop for members and non-members
4. Human	FG chairperson has high caliber of management, good practical knowledge about mango; ability to negotiate with private business partners; group organization is loosely structured	FG chairperson has high caliber of good management, good practical knowledge of about mango; well respected by contracting private processing company; well-structured organization with committee; capable sub-group leaders; individual farmers develop specialized skills, such as grading, tree pruning, personnel management
5. Social	80% of members can follow the rules and keep up with quality standards; no fixed date meeting, but has regular informal dialogue between chairperson and members	80% of members can keep up with rules and quality standards; members are more independent, distant relationship between members and certain sub-group leaders; monthly meeting to follow up on orchard management, target yield, and price

3. RESULTS AND DISCUSSION

3.1 Adaptive production system and marketing arrangement

The P-MFG and the NMP-MFG possessed different organizational structure and working principles, partly due to individual leadership and local context. The members of The P-MFG possessed small farm size, averaging 2 ha; many occupied both lowland paddy and upland fields, and engaged in diversified farming where mango was one component of farming enterprises. So the diversified land use functioned as livelihood security against market and price uncertainties. The paddy field produced rice for subsistence, and members would have rice sufficiency. Other fruit trees integrated in the orchards included longan, litchi, etc. A few

farmers had replaced unproductive litchi with Nam Dak Mai mango variety when demand for export increased.

The P/MFG produced late mango in June, when mango from the Central and Lower North had completed the season, thus the group enjoyed relative high price, but the season was short with about one month of harvesting period. So the P-MFG needed to distribute its products quickly by diversifying its market outlets through contracting several exporters with guaranteed price. This was achieved by the management competence of the group leader.

On the contrary, the members of the NMP-MFG in Lower North possessed larger farm size, averaging 8 ha on the rainfed terraces. The members only engaged in intensive mango farming, all became specialized in intensive mango farming. Any crop failure could end up with great farm debt. So the members always followed the mango price movement and government development policy and programs. The NMP/MFG produced earlier mango starting in January and extending until late April, with longer season, but varying price, receiving premium price in the early season and lower in the main season in March and April. The group, managed by committee members, adopted contracting farming arrangement with one key agro-processing company in Chiang Mai, supplying almost 500 tons of quality mangoes to be processed as frozen product specifically for Japanese market. The members skillfully controlled flowering process to force the tree to bear fruits in December-January and selling at higher price to open market, before the beginning of the contracting arrangement. The group claimed that the success of the early harvest in January when mango was priced more than Baht 50/kg at farm gate, the revenue could cover the annual production cost. Therefore all members were concerned about the stability of mango production in January. The unexpected rain in November could cause serious damage to fruit setting and lower fruit yield in January.

The contract farming arrangement with single private food processing company in Chiang Mai with guaranteed price before the fruiting season had helped stabilized farm income. The pre-determined price ranged from Baht 32/kg in early season to Baht 23/kg in late season. The company had the target for 1,000 tons from the NMP/MFG, but the group of 79 members was able to deliver only 450 to 500 tons. Farmers had to follow strict rules and regulations exerted by the company, particularly on chemical contamination. Farmers could only use chemicals as recommended by the company which was determined by the Japanese buyer. Farmers had to carry out farm records on crop management schedules, including spraying schedules and crop harvest. Copies of farm record had to be submitted in the shipment when the fresh mango was delivered to Chiang Mai. Any samples detected with chemical contamination, the whole shipment would be rejected.

The mango quality specified by the company was fruit size of 350 g/fruit and spotless fruit peel.

Despite the difference in organizational structure and marketing strategy, both groups showed similar pattern of disconnectedness between members and group leaders or group committee. The main motivation of joining the group was to get access to market and price guarantee higher than market price. It is conceivable that social disconnectedness would be a hindrance to the development of mango cluster in the future.

3.2 Farmer group competence

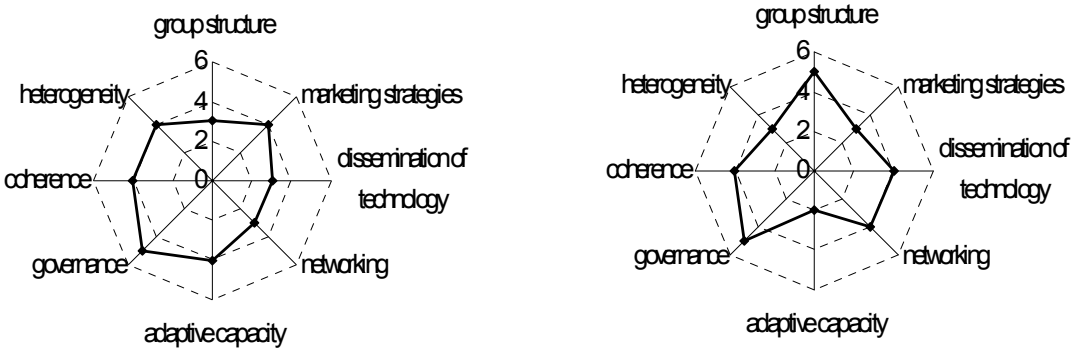
FGs' performances were assessed based on eight criteria, namely: group structure, marketing strategies, dissemination of technology, networking, adaptive capacity, governance, coherence, and heterogeneity. The approach had proved useful to raise farmers' aspirations and move to work at group level. Both groups could learn and adapt the best practice from the other, so that in the long run, the performance of each group could be improved. The system would strengthen the horizontal network of relations.

Table 2 shows that the P/MFG and NMP/MFG differs in organizational structure, marketing strategy, technology dissemination, and networking. One of the emerging issues derived from group assessment is that will the differences in these properties affect the process driving towards the formation "mango fruit cluster" in the future? How would "mango fruit cluster" so formed help improve adaptive capacity of FGs?

If the social learning space were made available for the flow of information and face-to-face exchange between the two FGs, and new generation of group leadership could emerge and develop, then it would be highly probable that the P-MFG could improve its organizational structure, by forming committee that works, and not to depend on group leader or chairperson entirely, while the NMP-MFG could consider the adoption of diversified market outlets, and not to depend solely on single outlet.

Table 2. Criteria for assessing mango farmers groups' performance of two study sites

Criteria	**P/MFG, Chiang Mai**	**NMP/MFG, Phitsanulok**
1. group structure	not well-structured, group formation to secure market access	Well-structured with proper management committee
2. marketing strategies	diversified market outlets, not confined to single exporter	Contract farming with one frozen food company, quality mango processed as frozen product for export
3. dissemination of technology	Not efficient, farmers engaging in diversified farming would not specialize in single commodity, few farmer meeting to share experience and knowledge	Using sub-group networking and monthly meeting to deliver services and technology
4. networking	Group leader established good partnership with external agencies including private exporters	Formed partnership with research institutions, universities, and extension agencies, local administration and local politicians
5. adaptive capacity	Highly adaptive, with short season, group leader followed closely mango price and made business agreements with several exporters to speed up the distribution.	Confined to frozen food company, had limited market outlets. Members sold other types of mango independently
6. governance	Despite single-handed management style, group leader was open and transparent, all business agreements made with consent of the whole group.	The management was open and transparent. The monthly meeting helped clarify the financial matter
7. coherence	Market and price incentive was the key driving factor for farmers to join group. When individual buyers offered higher price, shipment from members was reported to be lower.	The group established several means to help and benefit members such as cooperative shop, regular monthly meeting for information sharing and collective decision making
8. heterogeneity	Farmer members possessed diversified farming with varying enterprise compositions, and exhibited wider knowledge gap of quality mango production.	Farmer members engaged in mango production as single enterprise, and had similar level of knowledge in quality mango production.



(a) Prao mango farmers group (P/MFG)

(b) Noen Mahpang mango farmers group (NMP/MFG)

Figure 1. Mango farmers groups' capacity and performance assessment

3.3 Changing institutional roles in the process of developing fruit cluster

Both FGs had gone through a period of self-organization and self-adjustment through formation of mango farmer groups without governmental intervention. The group leader and associated committee members are all experienced mango farmers, they advocate transparency and good governance. During the farm household interview, all farmer members had high respect for the integrity of group leaders in both cases.

The need assessment of the FGs revealed that production technology that would lead to sustainable production, and post harvest technology that would improve the shelf life were very important for enhancing production efficiency. The post harvest technology is especially relevant and important to the mango industry in Prao district, Chiang Mai province. Since the season is short, by extending a shelf life would greatly increase the opportunity of market entry domestically as well as internationally. During the farmers-researchers workshop, both FGs had indicated the need to set up community learning center for integrated production and marketing in mango fruit chains, where farmers and researchers could meet regularly. On-farm visit by researchers to critically assess production capacity of fruit orchard had shown that there were knowledge gap in the management practice for production of quality mango. For instance, fruit pruning was not often carried out by farmers, or when it was practiced, it was not properly done, only light pruning was performed. To achieve 2,000 kg/rai fruit yield, a tree spacing of 4x4 meters is recommended, which will give a population of 100 trees/rai (625 trees/ha). A fully mature mango fruit tree after four to five years, with rigorous fruit pruning to maintain at 60 fruits/tree, and fruit size of 350 gm (export standard), farmer could achieve over 2,000 kg/rai. At present, the maximum farm yield at both study sites was about 1,250 kg/rai.

Technology development in fruit crop in Thailand is practically derived from farmer innovation, especially in fruit tree selection and breeding. There is economic incentive for producing own varieties and propagating high yielding good quality planting materials for general fruit tree growers, either for home garden or for commercial production. There is increasing role of researchers who can develop and add new knowledge by working closely with professional fruit growers who are able to consolidate the new knowledge and put it into improved practices. It is observed that the private fruit exporters play little role in technology innovation, majority would emphasize on the regulation of chemical use as prescribed by the foreign consumers. The meeting of farmers, exporters and researchers at the production site has created mutual understanding of the mango fruit chain, and each actor begins to see the loop hole or knowledge gap that needs to be filled and improved. For instance, the fruit

growth stage that is suitable for wrapping with paper bag, and stages when chemical spraying is strictly prohibited for production of safe fruit product.

Production of quality mango for export can no longer depend on local knowledge alone. Farmers need to know rules and regulations, food safety standards of the imported countries, as competition in the world market is increasingly intensified. During the workshop, researchers from the Post-harvest Technology Center, Chiang Mai University has briefly presented the evolution of food safety standards, such as Euro Gap and Global Gap as implemented by the European countries. Farmers need to understand the agri-food chains, and how the values have been distributed among key actors along the chains. The knowledge is well supported by the private fruit exporters who are members of Thai Fruits and Vegetables Exporters Association.

Thus the process of developing mango cluster would logically be by working first with FGs and their members, observing and understanding the existing systems through SWOT, exchanging technical information on quality mango production and post harvest handling between FG members and researchers from different institutes. The knowledge gap among members was identified particularly suitable growth stage for fruit wrapping, types of chemicals used for pest control, fruit pruning practice, etc. The interactive learning process between FGs and research institutions through workshop facilitation helped improve farmers' competence and confidence. Further exchange was developed by inviting other mango FGs from the regions to join the process. These were one new group from Chiang Mai and well-established groups from Phisanulok, Phichit, and Phetchabun provinces.

The subsequent inclusion of private sectors consisting of key trading partners and agro-chemical companies identified by FGs and researchers in the multi-stakeholder workshops proved to be effective way of working towards mango cluster. The workshop was accompanied by the on-site field visit to farmers' orchards. The interactive learning, particularly between FGs and trading partners and agro-chemical companies, allowed the latter to understand better the production process, farmer management practices and farm record which could facilitate traceability. Meanwhile the input from trading partners collectively provided better perspective on quality mango chain management (Figure 2). With the existing logistic arrangement, the quality product could be displayed on Japanese or the Netherlands consumer markets within 24 hours after its departure from the farm. Thus post harvest handling including strict grading at the farm level was essential.

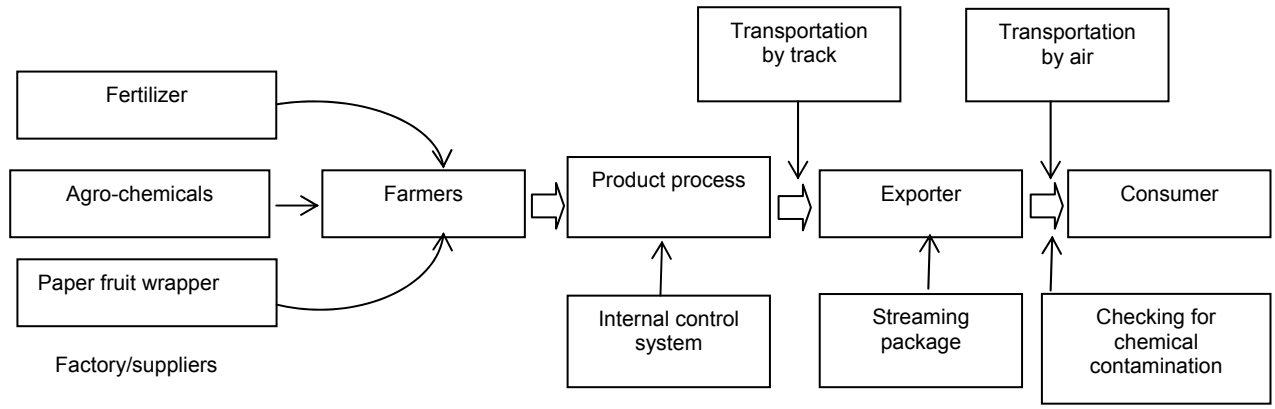


Figure 2. Key stakeholders in the mango supply chains

3.4 Competitive advantage of mango industry

The competitive advantage of the mango industry was analyzed by modifying Porter's Diamond Model (Figure 3). The key interlinked factors for competitive advantage were:

- With improved FGs and network, it is possible to produce year-round quality mango for export through maximizing the use of seasonal diversity across the regions. This means that mango farmer groups from the main growing regions in the Central, Northeast, Lower North and Upper North join force to plan for year round production and marketing.
- The existing technological innovations are able to provide cost-reduction practices if improved delivery systems are organized and coordinated.
- Increasing consumer demand for quality and safe products would force farmers to adapt and achieve new standardization, such as Euro Gap, Global Gap, etc. The GAP as presently promoted by the Department of Agricultural Extension and regulated by the Department of Agriculture is not enough; the certified system is not approved by the foreign buyers.
- The roles and functions of related supporting industries such as "fruit wrapper" paper manufacturing factory, irrigation facilities, farm machinery, pruning facilities, agro-chemical industries, cold storage facilities, transportation, etc. within special proximity would create interdependent relationships between related and supporting industries.
- Factor conditions favoring the competitive advantage are created during the transformation of agricultural systems into consumer-demand driven system, such as skilled labor in tree pruning, fruit grading, flower induction, plant propagation technique, etc.
- The roles of governmental agencies as catalyst to encourage or push FGs and private companies to move to higher levels of competitive performance, to oversee the fair benefit sharing systems between FGs and private exporters, and to coordinate the free flow of information and innovations. It is suggested that neutral governmental agencies, such as education institutions, acts as coordinator to facilitate the communication flows among stakeholders. Several demands for the government from the multi-stakeholder workshops included price regulation and quality control on chemical inputs, logistics support, expanding market opportunities, etc.

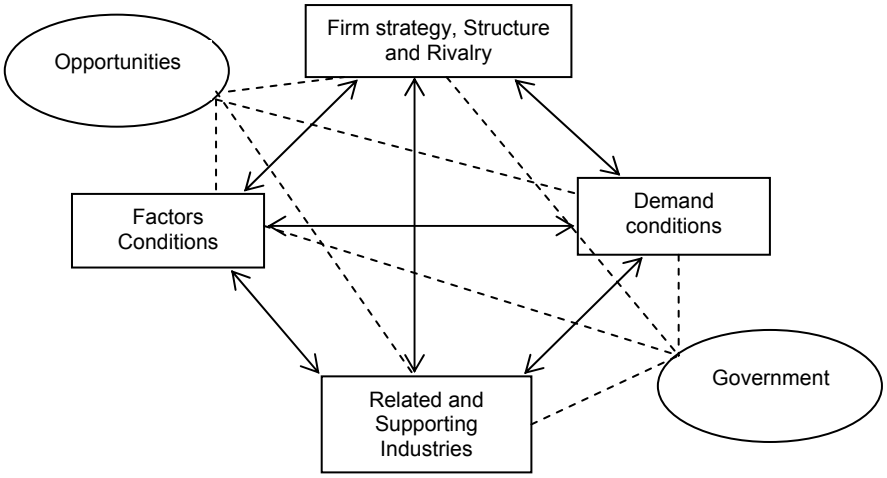


Figure 3. Poter's Diamond Model for the competitive Advantage of Nations

4. CONCLUSION

This research perceives that smallholder farmers who are producing quality agricultural products for export have to cooperate collectively and organize into membership based organization so that to improve collective skills in technical, logistical, and managerial ability in quality mango production and marketing. In the highly competitive globalizing economy, actors involved in the export market cannot operate in isolation. The notion of cooperative to compete, Porter's Diamond model for the Comparative Advantage of Nations and the concept of "clusters" is adapted to help mango farmers groups and associated trading partners understand the competitive position of their community business ventures.

The process working towards formation and development of mango cluster as perceived by this research project showed promising results and consequences. It focuses first on gradual building up farmers' individual competencies, and then group capabilities (Engel *et al*., 2007). Once farmer members develop their self-esteem, interaction with governmental research and extension institutions follows, with inclusion of private exporters and agro-chemical suppliers in the full-fledged multi-stakeholder workshop. The process ensures that all key actors in the workshop have equal status, so that no one would have power over the others, particular smallholder farmers.

In the production and marketing of quality mango, the relationship between farmer groups and private exporters is relatively interdependent, building on trust, and norm of exchange (Kemp and Ghauri, 2001) which is always open for negotiation**.** This would be enabling condition for forming workable fruit cluster. The scaling out of fruit cluster strategy would require strong group leadership and collective cooperation, first among farmer members, then symmetric relations between partners. The research has shown encouraging results but the cluster spirit requires further rigorous testing under various stress and perturbation.

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